

ENGINEERING DOCUMENTATION

Standard Hat Unit Type I

Dimensional & Integration Guide

DOCUMENT	REVISION / ISSUE	STATUS
DIG-ES-HG-S24-F40-R160	DRAFT-08 / 28 Aug 2026	Engineering Integration Reference

Integration Overview

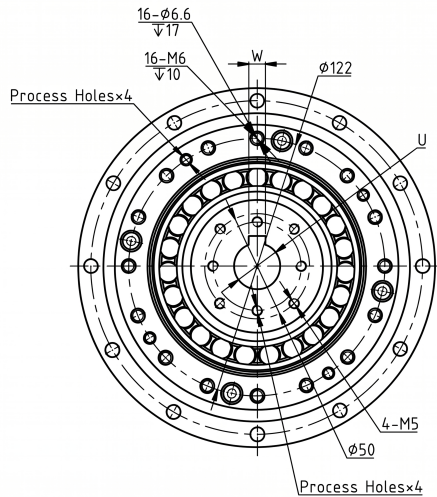
Standard Hat Unit Type I for compact, coaxial, high-ratio rotary-axis integration. This guide supports interface planning, mounting alignment, duty validation, torsional behavior, lubrication, sealing and commissioning for ES-HG-S24-F40-R160.

Key Integration Facts

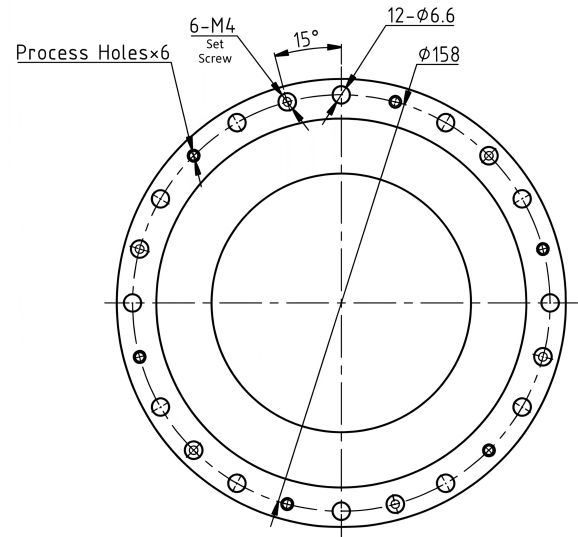
INTEGRATION ITEM	VALUE
Rated Torque	294 Nm
Instantaneous Maximum Torque	1180 Nm
Start/Stop Peak Torque	647 Nm
Backlash	±0 arc sec
Reduction Ratio	160
Maximum Input Speed	4000 r/min
Frame Size	40
Weight	4.4 kg

Product Structure & Views

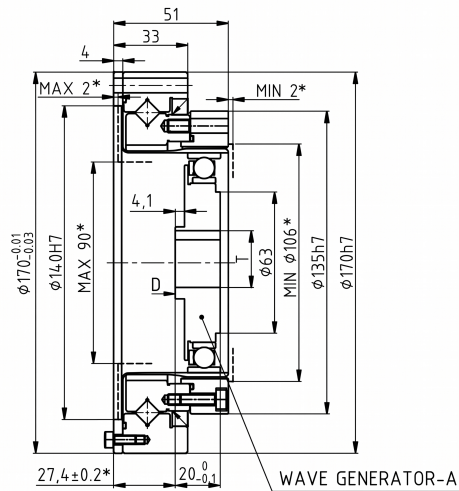
These views present the selected product structure, mounting interfaces and relevant integration geometry for this SKU.



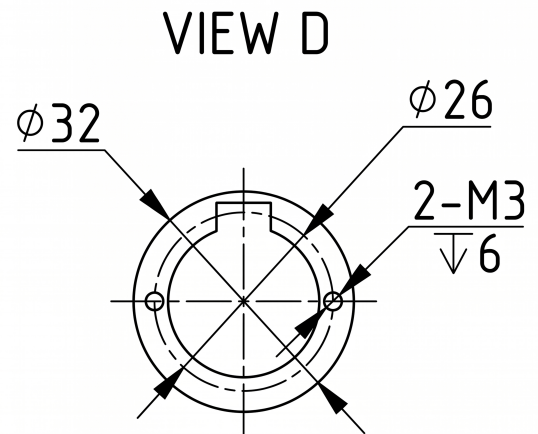
Mechanical View 1



Mechanical View 2



Mechanical View 3



Mechanical View 4

VIEW	FIELD	VALUE
Mechanical View 1	16 holes diameter 6.6 with depth 17	16 × Ø6.6 holes, depth 17
	16 M6 threaded holes with depth 10	16 × M6 threaded holes, depth 10
	Process holes quantity 4	Process holes ×4
	Width W	Width designated W, value not specified in this crop
	Diameter 122	Ø122
	Interface label U	Label U, numeric value not specified
	4 M5 threaded holes	4 × M5 threaded holes
	Diameter 50	Ø50

VIEW	FIELD	VALUE
Mechanical View 2	Number of process holes	6 process holes
	Threaded hole specification	6 × M4 threaded holes
	Set screw note	Set screw location/callout
	Angular spacing	15 degrees
	Mounting hole specification	12 × Ø6.6 holes
	Bolt circle diameter	Ø158 bolt/process hole circle diameter
Mechanical View 3	Upper overall length	51
	Upper inner length	33
	Left maximum clearance	Maximum 2
	Right minimum clearance	Minimum 2
	Local step dimension	4,1
	Outer diameter with negative tolerance	Diameter 170, upper deviation -0.01, lower deviation -0.03
	Bore fit diameter	Diameter 140 H7
	Maximum 90 callout	Maximum 90
	Datum or label D	D
	Minimum diameter	Minimum diameter 106
	Diameter 63	Diameter 63
	Diameter 135 h7 fit	Diameter 135 h7
	Diameter 170 h7 fit	Diameter 170 h7
	Bottom left axial dimension	27.4 ±0.2
	Bottom right axial dimension with unilateral tolerance	20, upper deviation 0, lower deviation -0.1
	Component label	Wave Generator-A
	Local axial dimension	4
	Datum T	Datum T
Mechanical View 4	View identifier	View D
	Inner diameter	Diameter 26 mm
	Outer diameter	Diameter 32 mm
	Threaded hole quantity and thread size	2 × M3 threaded holes
	Hole depth or countersink depth	Depth/countersink symbol 6 mm

Housing and Input Interface Dimensions

Housing Size: 40 Reduction Ratio: 160 Weight: 4.4 kg

WAVE GENERATOR	T (MM)	U	W
A14	16.3 +0.10	14 H7	5 JS9/P9
A19	21.8 +0.10	19 H7	6 JS9/P9
A22	24.8 +0.10	22 H7	
	25.3 +0.10		

Note: Dimensions in mm unless otherwise specified. Refer to the dimensional drawing for feature locations and datum definitions.

Input Interface Design Guidance

- Confirm the selected series, frame size, ratio and product form before using dimensions or interface geometry.
- Design the input shaft, key, engagement and axial retention for the verified torque and assembly state.
- Reserve assembly, sealing, inspection and removal access around input, housing and output interfaces.

Mounting, Alignment and Fastener Control

- Keep mounting faces flat, clean and free of burrs, debris and coating buildup.
- Control concentricity, tilt and axial position of input and housing datums.
- Tighten fasteners in a staged diagonal sequence and verify free, even rotation during assembly.

Torque, Speed and Duty Boundaries

PARAMETER	VALUE	UNIT
Rated Torque	294	Nm
Allowable Average Torque	451	
Start/Stop Peak Torque	647	
Instantaneous Maximum Torque	1180	
Maximum Input Speed	4000	r/min
Average Input Speed	3000	
Design Life	15000	h

- Calculate torque and speed from acceleration, constant-speed, deceleration, dwell and reversal portions of the complete cycle.
- Treat start/stop peak and instantaneous maximum torque as transient boundaries.
- Validate life against actual torque, speed, shock frequency, lubrication, temperature, alignment and external loading.

Torque, Speed and Life Boundaries

PARAMETER	VALUE	INTEGRATION REQUIREMENT
Rated Torque	294 Nm	Use as the selected continuous output rating under validated duty and thermal conditions.
Allowable Average Torque	451 Nm	Calculate the actual time-weighted output torque over the complete cycle.
Start/Stop Peak Torque	647 Nm	Transient start/stop boundary; include acceleration and deceleration events.
Instantaneous Maximum Torque	1180 Nm	Short-duration shock boundary only; do not use as a normal operating point.
Maximum Input Speed	4000 r/min	Maximum input-speed boundary; also verify motor and thermal limits.
Average Input Speed	3000 r/min	Validate the time-weighted average input speed over the complete duty cycle.
Design Life	15000 h	Design reference only; actual life depends on torque, speed, shock, lubrication and installation.

Transmission Accuracy and Torsional Rigidity

PARAMETER	VALUE	UNIT
Backlash	20	arc sec

- Installed positioning depends on reducer behavior, datum control, structural stiffness, motor and encoder errors and thermal growth.
- Use stiffness regions and transition torques when evaluating compliance, resonance, control gain and reversal.

Lubrication, Sealing and Thermal Control

- Use the specified lubricant, fill method and quantity for the exact configuration; do not mix incompatible lubricants.
- Provide compatible sealing at input, output and housing interfaces without distorting the reducer.
- Validate lubricant distribution and temperature for orientation, speed, load cycle and enclosure.
- Prevent chips, fibers, residue and moisture from entering gear or bearing cavities.

Output Bearing and External Load Path

- Calculate radial, axial and moment loads including offset, acceleration, gravity, process force, impact and emergency stops.
- Do not infer permissible external load from reducer torque capacity or frame size.
- Avoid forcing, impact, misalignment or host distortion through the output support during installation and operation.

Integration Checklist

- 01 Confirm the selected series, frame size, ratio and product form for this SKU.
- 02 Verify available dimensions and interface geometry without substituting a nearby configuration.
- 03 Check mounting-face flatness, concentricity, tilt, reliefs, cleanliness and support stiffness.
- 04 Verify input shaft, key, engagement length and axial retention.
- 05 Use staged diagonal tightening and verify free, even rotation.
- 06 Calculate average, start/stop peak and shock torque over the complete cycle.
- 07 Validate average and maximum input speed, design life and thermal condition.
- 08 Evaluate backlash, angular accuracy, hysteresis and stiffness for the control system.
- 09 Confirm lubricant, fill quantity, orientation, sealing and contamination controls.
- 10 Validate output radial, axial and moment loads using applicable bearing data.

[View SKU Product Datasheet](#) [Request controlled 2D drawing](#) [Request controlled STEP review](#) [Request a Quote](#)

Engineering Use and Verification Notice

01. This Dimensional & Integration Guide applies only to EmbodyStack SKU ES-HG-S24-F40-R160 and supports preliminary dimensional evaluation and integration. It is not a manufacturing drawing, reducer selection approval, bearing-load approval, lubrication specification, machinery risk assessment, safety validation or integration planning document. Before design freeze, assembly or commissioning, verify all dimensions, datum geometry, fits, interfaces, retention, fasteners, torque and speed duty, shock cases, torsional behavior, external loads, lubrication, sealing, temperature, contamination and maintenance requirements against the current EmbodyStack engineering data for this exact SKU. Validate the complete reducer, motor, host structure, output load, motion cycle, guarding, fault cases and applicable regulatory requirements under intended operating conditions.